

### **A.3.5 Reduced Operation Alternative, Site 300**

The following project would be curtailed under the Reduced Operation Alternative. This would be a change to the baseline operations described under the No Action Alternative. The project is summarized in Table A.3.3–1.

#### **A.3.5.1 Reduce Number of Hydroshots at Site 300**

Under the Reduced Operation Alternative, NNSA proposes to perform fewer intentional detonation experiments at Site 300 firing tables or the Building 801 Contained Firing Facility, resulting in a reduction of both hazardous and radioactive materials including tritium. This would result in a reduction in the maximum annual tritium emissions from 200 curies to 150 curies. Other types of experiments such as environmental testing of explosives assemblies would continue unchanged in the number of experiments and amounts of tritium. The programmatic impacts of this alternative could include having less confidence in the evaluation of two types of component functions within weapon systems.

### **A.4 RADIOACTIVE MATERIALS AND CHEMICAL INVENTORIES—LIVERMORE SITE AND SITE 300**

Radioactive and chemical inventory data for the Livermore Site and Site 300 are listed in Table A.4–1 through Table A.4–6. Emission rates are listed in Tables A.4–7 and A.4–8.

Waste and inventory data include:

- Radioactive materials inventories for the selected facilities (Tables A.4–1 and A.4–2)
- Chemical inventories for the selected facilities (Tables A.4–3 and A.4–4)
- Estimated emission rates, based on 2001 fuel use (Tables A.4–5 and A.4–6)
- High explosives, maximum quantities – 100,000, annual facility average quantities – 15,000 pounds, facility locations LLNL-wide.

The inventory data listed in Tables A.4–1 through A.4–6 represent only the selected facilities described in this appendix. The tables show typical quantities rather than maximum limits. These chemicals and radioactive materials are subject to change as LLNL experimental requirements change. Additionally, the chemical inventory data presented in this appendix for both sites were reduced from an extensive list and were limited to extremely hazardous chemical quantities greater than 1 pound and all other chemical quantities greater than 500 pounds present in these selected buildings. Therefore, some chemicals listed in the building descriptions may be used in smaller quantities and may not appear in the tables. Figures A.4–1 and A.4–2 show waste management facilities at the Livermore Site and Site 300, respectively.

**TABLE A.4–1.—Radionuclide Inventories<sup>a</sup> for Selected Livermore Site Facilities**

<b>Building Number</b>	<b>Radionuclide</b>	<b>Approximate<sup>c</sup> Quantity or Limit (kg, lb, or Ci)</b>	<b>Status<sup>d</sup></b>
Building 131 High Bay	Natural thorium	0.5 kg	Radiological facility
	Depleted uranium	7,700 kg	
		Inventory maintained below Category 3 thresholds	
Building 132N	Natural uranium	Inventory maintained below Category 3 thresholds	Radiological facility
	Depleted uranium		
	Sealed sources		
Building 132S	Natural uranium	Inventory maintained below Category 3 thresholds	Radiological facility
	Depleted uranium		
	Sealed sources		
Building 151	15 radionuclides	Inventory maintained below Category 3 thresholds. Ratio approximately 0.633 <sup>b</sup>	Radiological facility
Building 152	Sealed sources	Inventory maintained below Category 3 thresholds	Radiological facility
Building 154	Sealed sources	Inventory maintained below Category 3 thresholds	Radiological facility
Building 190	Tritium	20.0 Ci	Radiological facility
	Cobalt-60	$1.43 \times 10^{-4}$ Ci	
	Americium-241	$1.11 \times 10^{-5}$ Ci	
	Plutonium-238	0.027 Ci	
	Plutonium-239	1.50 Ci	
Building 191	Depleted uranium	0.008 Ci	Radiological facility
Building 194	Uranium-235	0.192 kg	Radiological facility
	Plutonium-239	0.003 kg	
	Sealed sources	Inventory maintained below Category 3 thresholds	
Building 231	Natural thorium	0.5 kg	Radiological facility
	Natural uranium	9.5 kg	
	Depleted uranium	3,000 kg	
	Rhenium	60 kg	
Building 231 vault	Natural thorium	11 kg	Radiological facility
	Uranium-235	3.4 kg	
	Uranium-238	1,700 kg	
Building 232 Fenced Area and 233 Vault	Thorium	150 kg	Radiological facility
	Low enriched uranium	0.3 kg	
	Natural or depleted uranium	4,000 kg	
Building 239	Plutonium, fuel grade equivalent <sup>e</sup>	6 kg	Varies; resident inventory maintained below Category 3 thresholds
	Highly enriched uranium <sup>e</sup>	25kg/50 kg <sup>f</sup>	
	Depleted uranium	500 kg	
	Tritium	0.02 kg	

**TABLE A.4–1.—Radionuclide Inventories<sup>a</sup> for Selected Livermore Site Facilities (continued)**

<b>Building Number</b>	<b>Radionuclide</b>	<b>Approximate<sup>c</sup> Quantity or Limit (kg, lb, or Ci)</b>	<b>Status<sup>d</sup></b>
Building 241	Depleted uranium 5 radionuclides	2,650 kg Inventory maintained below Category 3 thresholds	Radiological facility
Building 251	42-Category 2 radionuclides	Inventory maintained below Category 2 thresholds	Category 2 facility
Building 255E	Sealed sources	Inventory maintained below Category 3 thresholds	Radiological facility
Building 261/262	16 Radionuclides	Inventory maintained below Category 3 thresholds	Radiological facility
	Thorium	100 lbs (Metal)	
	Natural uranium	100 lb	
	Depleted uranium	300 lb	
Building 322	Depleted uranium	30 kg	Radiological facility
Building 327	Depleted uranium	95 kg	Radiological facility
Building 331 <sup>g</sup>	Tritium <sup>e</sup> Plutonium-239 Plutonium, fuel-grade equivalent Uranium-235 HEU	0.030kg/0.035 kg <sup>f</sup> 900 g 260 g 700 g 5 kg	Inventory is distributed between two segments; small quantities of other radionuclides may be present but the facility will remain a Category 3 facility
Building 332	Plutonium <sup>e</sup> Enriched uranium <sup>e</sup> Depleted or natural uranium <sup>e</sup>	700kg/1,400 kg <sup>f</sup> 500 kg 3,000 kg	Category 2 facility
Building 334 <sup>g</sup>	Plutonium, fuel grade equivalent <sup>e</sup> Enriched uranium Depleted uranium Tritium	18 kg 100 kg 500 kg 0.0001 kg	Category 3 facility
Building 361	Phosphorus-32 Sulphur-35 Carbon-14 Tritium	0.027 Ci 0.008 Ci 0.131 Ci 0.29 Ci	Radiological facility
Building 362	Carbon-14 Tritium	0.036 Ci 0.006 Ci	Radiological facility
Building 363	Carbon-14 Tritium	0.002Ci 0.001 Ci	Radiological facility
Building 364	Cesium-137 (sealed Source)	$3.5 \times 10^3$ Ci	Radiological facility
Building 366	Phosphorus-32	0.007 Ci	Radiological facility
Building 378	20 radionuclides (Sealed sources)	Inventory maintained below Category 3 thresholds	Radiological facility
Building 379	20 radionuclides (Sealed sources)	Inventory maintained below Category 3 thresholds	Radiological facility
Building 381	Tritium Sealed sources	8.5 Ci (storage limit – 20 Ci) Inventory maintained below Category 3 thresholds	Radiological facility

**TABLE A.4–1.—Radionuclide Inventories<sup>a</sup> for Selected Livermore Site Facilities (continued)**

<b>Building Number</b>	<b>Radionuclide</b>	<b>Approximate<sup>c</sup> Quantity or Limit (kg, lb, or Ci)</b>	<b>Status<sup>d</sup></b>
RHWM Facilities (Area 514)	Miscellaneous radionuclides	Inventory maintained below Cat 3 thresholds	Radiological facility
RHWM Facilities (Area 612)	Cat 2 radionuclides	See Appendix B for inventory limits	Category 2 facility
DWTF Buildings 695/696S	Cat 3 radionuclides	See Appendix B for inventory limits	Category 3 facility
DWTF Building 693/696RWSA	Cat 2 radionuclides	See Appendix B for inventory limits	Category 2 facility
Cargo Container Testing facility (planned)	Depleted or natural uranium	50 kg	Radiological facility
	Uranium-235		
	Plutonium-239	1.0 kg (metal), 0.2 kg (oxide)	
	Sealed sources	0.40 kg	
		Inventory maintained below Category 3 thresholds	

Source: LLNL 1999b, g; LLNL 2000d, k, l, o, p; LLNL 2001b,e, f, aw; LLNL 2002ar, co, cq.

<sup>a</sup>Summary information, additional radionuclides may be present in these facilities.

<sup>b</sup>Ratio of activity to Category 3 threshold must be below 0.8 in order for a radiological accident analysis to not be required in a hazard analysis report.

<sup>c</sup>Inventories are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.

<sup>d</sup>Category 2 – Hazard analysis shows the potential for significant onsite consequences. Category 3 – Hazard analysis shows the potential for only significant localized consequences. Radiological–Facilities that do not meet or exceed Category 3 threshold criteria but still possess some amount of radioactive material. Category 2 and Category 3 thresholds are defined in DOE Standard DOE-STD-1027-92 (DOE 1997d).

<sup>e</sup>Administrative limit.

<sup>f</sup>Values are included for No Action Alternative and the Proposed Action, respectively.

<sup>g</sup>Materials in Buildings 331 and 334 are within the Superblock Administrative Limits for plutonium and uranium.

Ci = curies; DWTF = Decontamination and Waste Treatment Facility; kg = kilograms; RHWM = radioactive and hazardous waste management; RWSA = radioactive waste storage area.

**TABLE A.4–2.—Radionuclides Inventories<sup>a</sup> for Site 300 Facilities**

<b>Material</b>	<b>Use</b>	<b>Approximate Quantities<sup>b</sup></b>
Depleted uranium	Assembly	4.2 Ci
	Components	10,640 kg
Thorium-232	Assembly	0.1 Ci
	Components	910 kg
Tritium	Assembly	193 Ci
	Components	20 mg

Source: LLNL 2002l.

<sup>a</sup> Inventories are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.

<sup>b</sup> Approximate quantities are for each authorized facility.

Ci = curies; kg = kilograms; mg = milligrams.

**TABLE A.4–3.—Livermore Site Chemical Quantities in 2002**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Beryllium oxide	500	350	lb
Boron	2,600	500	lb
Bright Plating solution	130	55	gal
Brulin MP 1793	200	100	gal
BSP Captor Solution	170	55	gal
Bulls Eye 1-2-3 Primer/Sealer	750	55	gal
Butyl alcohol (n-Butanol)	510	55	gal
Calcium chloride	3,200	500	lb
Calcium sulfate	1,300	500	lb
Carbon, activated	800	500	lb
Carbon dioxide	176,000	124,000	ft <sup>3</sup>
Carbon monoxide	4,000	1,300	ft <sup>3</sup>
Celite 535	2,000	950	lb
Cement, Kast-o-lite	1,300	500	lb
ChemTreat BL-1253	1,200	1,200	gal
ChemTreat BL-1302	600	600	gal
ChemTreat BL-1543	110	55	gal
ChemTreat BL-1776	1,000	140	gal
ChemTreat BL-1821	700	55	gal
ChemTreat CL-1467	700	55	gal
ChemTreat CL-2111	800	300	gal
ChemTreat CT9001-Antifoulant	55	55	gal
Chlorine	150	100	lb
Chloroform	110	55	lb
Chrome or Chromium	4,700	1,500	lb
Chromium (III) chloride	12	1	lb
Citric acid, anhydrous	1,600	400	lb
Cobalt	16,500	14,000	lb
Concresive Adhesive, Part A/B	330	55	gal
Copper sulfate, crystals & solution	1,100	500	lb
Cutting fluid, Aluminum A-9	100	90	gal
Cutting Fluid, Cool Tool (I & II)	390	55	gal
Cyanuric acid	2,500	500	lb
Dascool 2227	500	55	gal
DDO-19, Lubricating oil	500	55	gal
Delvac Motor oil	300	55	gal
DESMODUR	110	55	gal
Detergent, ND 150	300	55	gal
Diesel	30,000	10,000	gal
Dimethyl sulfoxide	220	55	gal
4,4'-Diphenylmethane diisocyanate	1,000	500	lb
DowTherm SR-1 30 Heat Transfer Fluid	110	55	gal
ELNIC 100 C-5	250	55	gal
ELNIC 100 RP-1	60	60	gal
ELNIC 100 RP-2	150	110	gal
Epolene Wax, Polyethylene, oxidized	110	55	gal
Ethyl alcohol	2,000	1,500	gal

**TABLE A.4-3.—Livermore Site Chemical Quantities in 2002 (continued)**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Ethylene, compressed	5,700	1,900	ft <sup>3</sup>
Ethylene glycol	500	110	gal
Ethyl silicate	150	55	gal
Ferric chloride, Iron chloride(III)	1,400	500	lb
Ferric sulfate	3,500	700	lb
Fertilizer, Pro-Turf 25-3-10	11,000	5,500	gal
Freon 11 (Trichlorofluoromethane)	10,000	5,000	lb
Freon 12 (Dichlorodifluoromethane)	6,300	4,000	lb
Freon 14 (Tetrafluoromethane)	2,500	500	ft <sup>3</sup>
Freon 22 (Chlorodifluoromethane)	9,000	5,000	lb
Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	17,000	5,000	ft <sup>3</sup>
Gasoline	24,000	24,000	gal
Glass Cleaner, variety	2,300	200	gal
Glycerine	110	55	gal
Hafnium oxide	4,700	4,500	lb
Halocarbon 23	400	200	ft <sup>3</sup>
Halon 1301 (Bromotrifluoromethane)	2,000	1,600	lb
Helium	5,000,000	300,000	ft <sup>3</sup>
Herbicide, Ronstar	2,000	700	lb
Herbicide, Roundup	220	40	gal
Hexane	250	160	gal
Hydrochloric acid	600	400	gal
Hydrofluoric acid	1,500	850	lb
Hydrogen, compressed	1,500,000	50,000	ft <sup>3</sup>
Hydrogen peroxide<52%	350	55	gal
Insulating Oil, Inhibiting	1,800	1,200	gal
Isopropyl alcohol	650	550	gal
Joint Compound, All purpose	45,000	12,100	lb
Kerosene (Naphtha Petroleum)	300	55	gal
Kodak Fixer & Replenisher	650	250	gal
Krypton, compressed	1,600	1,100	ft <sup>3</sup>
Lead Bricks or ingots	950,000	950,000	lb
Lithium Grease	110	55	gal
Lithium Hydride	4,000	4,000	lb
Lubricating Oil	500	300	gal
Macro Brite L-7	220	110	gal
Magnesium chloride	6,000	500	lb
Manganese	3,500	3,000	lb
Mastic Patch adhesive, variety	400	55	gal
Metex L-5B	220	55	gal
Methane	100,000	30,000	ft <sup>3</sup>
Methyl alcohol	1,800	500	gal
Methylene chloride	2,000	55	gal
Methyl ethyl ketone	400	55	gal
Mineral dust, Aquaset	10,000	4,500	lb
Mineral oil	2,000	55	gal
Mineral spirits	400	55	gal

**TABLE A.4–3.—Livermore Site Chemical Quantities in 2002 (continued)**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Modified Bitumen adhesive	350	200	gal
Neodymium oxide	7,000	1,350	lb
Neon, compressed	750,000	500,000	ft <sup>3</sup>
Nickel	1,500	500	lb
Nickel chloride	80	70	gal
Nickel sulfate	220	110	gal
Nitric acid	5,000	1,800	lb
Nitric oxide	1,000	500	lb
Nitrogen, compressed (Liquified, gaseous)	38,000,000	18,000,000	ft <sup>3</sup>
Nitrous oxide	4,000	1,200	ft <sup>3</sup>
Oakite (Liqui-det)	80	55	gal
Oil, Diala AX	2,200	1,050	gal
Oil, DTE-24	700	440	gal
Oil, DTE-25	450	355	gal
Oil, DTE-26	2,000	400	gal
Oil, DTE, extra heavy	500	165	gal
Oil, DTE heavy	850	55	gal
Oil, DTE Medium	220	55	gal
Oil, Spindle	700	355	gal
Oil, Tellus, variety	275	55	gal
Oil, Vactra, variety	500	400	gal
Oil, Vacuum Pump fluid, variety	1,500	55	gal
Oil, Waste	2,500	1,000	gal
Oxalic acid	700	500	lb
Oxygen, compressed	870,000	75,000	ft <sup>3</sup>
OzzyJuice SW3, Cleaner/Degreaser	300	55	gal
Paint (variety)	700,000	320,296	lb
Perchloroethylene (Tetrachloroethylene)	250	55	gal
Phosphoric acid	3,600	1,000	lb
Potassium chloride	3,500	1,200	lb
Potassium hydroxide	15,000	400	lb
Potassium Phosphate, Monobasic	10,000	2,000	lb
Potassium silicate	1,100	500	lb
Power Plus, Cleaner & Degreaser	110	55	gal
Printing Ink, variety	1,000	850	lb
Propane	45,000	1,000	gal
Refrigerant, 123 SUVA, (2,2-Dichloro-1,1,1-Trifluoroethane)	35,000	1,500	lb
Refrigerant 406A	720	500	lb
Rough Rider Emulsion Degreaser	110	55	gal
Rubinate fluid	110	55	gal
Sanding Sealer	200	90	gal
sec-Butanol	130	122	gal
Shur-Stik Wall Covering Adhesive	110	55	gal
Silane, compressed	2,100	200	ft <sup>3</sup>
Silicon carbide	3,200	500	lb

**TABLE A.4–3.—Livermore Site Chemical Quantities in 2002 (continued)**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Silicone Transformer Fluid/Dow	700	165	gal
Simple Green Degreaser	140	55	gal
Sodium bicarbonate	3,600	500	lb
Sodium chloride	3,200	800	lb
Sodium cyanide	250	100	lb
Sodium hydroxide	25,500	14,000	lb
Sodium hypochlorite (Bleach)	12,000	1,000	gal
Sodium nitrate	1,500	350	lb
Solvent AZ-EBR	165	55	gal
Spill clean-up kit, Acids	1,600	500	lb
Spill clean-up kit, Caustic	1,000	500	lb
Spill clean-up kit, Solvent	710	500	lb
Strontium phosphate	1,400	350	lb
Sulfur hexafluoride, compressed	25,000	10,000	ft <sup>3</sup>
Sulfuric acid	11,000	4,500	lb
Super Dropout	1,590	1,590	lb
Suva MP39 (R401A)	800	600	lb
Suva MP66 (R401B)	180	180	gal
Tantalum	75,000	20,000	lb
Tantalum oxide blend	17,000	8,500	lb
Thinner, Lacquer	3,000	500	gal
Toluene	480	300	gal
TPX	800	800	lb
Transmission fluid, Dexron II (ATF)	220	55	gal
Trichloroethylene	350	165	gal
Trim Clear	110	55	gal
Trim Sol, coolant	660	165	gal
Tungsten	2,500	500	lb
Voranol	110	55	gal
Wax, Floor	300	300	gal
Xenon, compressed	2,000	500	ft <sup>3</sup>
ZEP Formula 50	110	55	gal

Source: LLNL 2002bg.

<sup>a</sup> Summary information. Numbers may be rounded.<sup>b</sup> Estimates are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.ft<sup>3</sup> = cubic feet; gal = gallons; lb = pounds.



**TABLE A.4-4.—Site 300 Chemical Quantities in 2002**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Acetone	400	30	gal
Acetylene	10,000	7,500	ft <sup>3</sup>
Activated Carbon	20,000	15,000	lb
Air	28,000	15,000	ft <sup>3</sup>
Alcoa Atomized Powder	3,000	2,000	lb
Ammonium Perchlorate	760	760	lb
Argon	30,000	30,000	ft <sup>3</sup>
Asphalt Emulsion	300	200	gal
Auto Transmission Fluid (including Dexron)	400	300	gal
Bacticide Solution	220	110	gal
n-Butyl Acetate	55	55	gal
Calla Soap	165	55	gal
Carbon Dioxide	44,000	5,000	ft <sup>3</sup>
Cast Iron, Shot (Chips)	6,000	6,000	lb
Chlorine	2,250	1,500	lb
Cleaner, Degreaser, Big Orange	110	55	gal
Cleaner, Butcher's Hot Springs	55	55	gal
Cleaner, Degreaser, Clean-Way II	110	55	gal
Cleaner, Degreaser, OzzyJuice SW-3	330	110	gal
Coating, Acrylic Terpolymer	244	90	gal
Coating, Polytherm, FP-576	220	110	gal
Coating, Polyurethane, Vulkem 350, Gray	60	60	gal
Coating, Polyurethane, Vulkem 351, Gray	110	55	gal
Coating, Roof, Acrylic	2,500	500	gal
Condensate wastewater	4,500	3,600	gal
Cyanuric Acid	500	50	lb
Diesel	12,000	10,000	gal
Dimethyl Sulfoxide	400	55	gal
2,2-Dinitropropanol in EDC	275	275	gal
Ethyl Acetate	100	30	gal
Ethyl Alcohol	56	56	gal
Ethylene Glycol	200	100	gal
FEFO SOL (in methylene chloride)	1,100	10	gal
Floor wax	165	110	gal
Freon 12	660	220	lb
Freon 13	478	478	ft <sup>3</sup>
Freon 22	1,400	870	lb
Freon 113 (Freon, TF)	150	110	gal
Gasoline	15,000	15,000	gal
Glycerin	165	165	gal
Helium	25,000	25,000	ft <sup>3</sup>
n-Hexane	220	220	gal
High Explosives	100,000	10,000	lb
Hydrogen	700	700	ft <sup>3</sup>
Isoamyl alcohol	55	55	gal
Isopropyl Alcohol	300	100	gal

**TABLE A.4-4.— Site 300 Chemical Quantities in 2002 (continued)**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Kerosene	160	5	gal
Krovar I DF Herbicide	2,000	500	lb
Lacquer Thinner	110	35	gal
Lead (bricks, ingots)	25,000	5,000	lb
Lubricant, Synthetic Summit/Vactra, etc.	330	165	gal
Methane	3,000	1,500	ft <sup>3</sup>
Methyl alcohol	90	5	gal
Methyl Ethyl Ketone	100	5	gal
Mixed Gas, Freon 502	500	200	ft <sup>3</sup>
Mixed Gas, Freon 503	500	200	ft <sup>3</sup>
Mixed Gas, Compressed, Not Otherwise Specified (nonhazardous)	1,000	1,000	ft <sup>3</sup>
Mixed gas, TCE/Nitrogen	7,400	50	ft <sup>3</sup>
Nalco-71-D5	165	55	gal
Nalco-2508	110	55	gal
Nalco-2536	55	55	gal
Nalco-2593	55	55	gal
Nalco-2802	110	55	gal
Nalco-2833	55	55	gal
Nalco-2858	200	55	gal
Nalco-2896	450	250	gal
Nitrogen	312,000	280,000	ft <sup>3</sup>
Nitroplasticizer	175	110	gal
N-Octane	55	55	gal
Oil, Crankcase, 76 Guardol QLT 30	220	55	gal
Oil, Hydraulic (DTE, Unocal, CITGO, 76 UNAX AW32)	1,400	700	gal
Oil, Inhibited Insulating	25,000	5,000	gal
Oil, Mineral	220	55	gal
Oil, Motor (all weights)	650	400	gal
Oil, Shell Oil Tellus 23	110	55	gal
Oil, Transformer, Shell Diala-AX/Equivalent	15,000	15,000	gal
Oil, Turbine (Extra Heavy, HD 92)	110	55	gal
Oil, Vacuum Pump	330	55	gal
Oil, Vitrea 100	55	55	gal
Oil, Waste	1,000	110	gal
Oxygen	16,000	5,000	ft <sup>3</sup>
Paint, acrylic (e.g., semi-gloss)	600	100	gal
Paint, Street Markings	300	55	gal
Paint Spray Wastewater	1,200	600	gal
Pentane	85	85	gal
Petroleum ether	220	55	gal
Photo wastes	400	110	gal
Polyol	120	55	gal
Propane	20,000	8,000	ft <sup>3</sup>
Roundup herbicide	100	90	gal
Sodium bicarbonate	550	40	lb

**TABLE A.4–4.— Site 300 Chemical Quantities in 2002 (continued)**

Material	2002 Report Year <sup>a,b</sup>		Unit
	Maximum Quantity	Average Quantity	
Sodium chloride	7,400	100	lb
Sodium hypochlorite/Purechlor Sanitizer/bleach	500	55	gal
Sodium nitrate	1,000	16	lb
Steam Cleaning Solution/Split Equipment Cleaner	3,000	400	gal
STIK-IT Asphalt Base Seal	560	5	gal
Stoddard solvent/paint thinner	200	60	gal
Sulfur hexafluoride	19,500	7,700	ft <sup>3</sup>
Sulfuric Acid	845	60	lb

Source: LLNL 2002bg.

<sup>a</sup> Summary information. Numbers may be rounded.<sup>b</sup> Estimates are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.ft<sup>3</sup> = cubic feet; gal = gallons; lb = pounds.

**TABLE A.4–5.—Typical Hazardous Chemicals at Some Selected Facilities <sup>a</sup> at the Livermore Site**

Facility	Material	Approximate Quantity	Unit
Building 131 High Bay	Beryllium	760	kg
	Beryllium oxide	120	kg
	Lithium hydride/Lithium deuteride	230	kg
	Mercury	9	kg
Building 132N	Ethylene dibromide	2.92	lb
	Arsenic	2.2	lb
	Arsenic trioxide	2.97	lb
	Benzene	44.7	lb
	Beryllium	0.44	lb
	Carbon Tetrachloride	60.2	lb
	Chloroform	166.3	lb
	Potassium dichromate	23.7	lb
	Lead	30.3	lb
	Mercury	3.17	lb
	Selenium	1.5	lb
	Silver Nitrate	5.58	lb
	Sodium	17.8	lb
	Potassium cyanide	3.2	lb
	Sodium cyanide	2.2	lb
Building 132S	Beryllium	b	–
	Chloroform	0.26	gal
	Cupric sulfate	1.1	lb
	Formaldehyde	5.13	gal
	Mercury	5	lb
	Trichloroethylene	48	lb
	Hydrogen chloride gas	15	ft <sup>3</sup>
Building 141	Arsenic	3.5	lb
	Phosphorus	3.5	lb
	Chromium trioxide	240	lb
	Cupric sulfate, anhydrous	2.6	lb
	Methylamine, anhydrous	24	lb

**TABLE A.4–5.— Typical Hazardous Chemicals at Some Selected Facilities <sup>a</sup> at the Livermore Site (continued)**

Facility	Material	Approximate Quantity	Unit
Building 151	Hydrogen chloride gas	b	–
	Chromium (III) chloride	b	–
	Arsenic pentoxide	b	–
	Arsenic trioxide	b	–
	Hydrazine	b	–
	Carbon tetrachloride	b	–
	Chloroform	b	–
	Benzene	b	–
	Lead	b	–
	Mercury	b	–
	Arsenic	b	–
	Hydrofluoric acid	b	–
	Silver nitrate	b	–
	Selenium	b	–
Building 153	Hydrogen chloride gas	b	–
Building 191	1,2-dibromoethane	2	lb
	Hydrazine	<1	lb
	Silver nitrate	<1	lb
	1,2-dichloroethane	100	lb
	Captan	15	lb
	Xylene	125	lb
	Carbon tetrachloride	65	lb
	Chloroform	75	lb
	Benzene	25	lb
	Chloroacetic acid	<1	lb
Building 194	Arsine	b	–
	Beryllium	b	–
	Phosphine	b	–
	Silane	b	–
	Sulfur hexafluoride	3,000	ft <sup>3</sup>
Building 197	Arsenic pentafluoride	1	lb
	Arsine	0.28	lb
	Boron trifluoride	0.15	lb
	Chlorine gas	8.25	lb
	Diborane	0.16	lb
	Hydrogen chloride gas	0.32	lb
	Nitrogen trifluoride	11	lb
	Phosphine	0.12	lb
	Phosphorous pentafluoride	0.15	lb
	Silane	11	lb
	Hydrofluoric acid	500	ml

**TABLE A.4–5.— Typical Hazardous Chemicals at Some Selected Facilities <sup>a</sup> at the Livermore Site (continued)**

Facility	Material	Approximate Quantity	Unit
Building 231	Sodium nitrate	80	lb
	Hydrogen chloride (gas)	15.2	lb
	Selenium	10.4	lb
	Trichloroethylene	116	lb
	4,4'-Methylenedianiline	10.6	lb
	Hydrogen (gas)	120	lb
	2-Butanone, peroxide	39.6	lb
	Sodium cyanide	4.3	lb
	Lead	210	lb
	Nickel	111.8	lb
	Fluorine	100	lb
	Dichloromethane	1,200	lb
	Beryllium	4.4	lb
	Lithium hydride/deuteride	4.4	lb
Building 231V	Lithium hydride	300	kg
	1,1,1-Trichloroethane	~10	kg
	Beryllium (solid)	<5	kg
	MDI	~127	kg
Building 232 Fenced Area and 233 Vault	Lithium	555	kg
Building 235	Dichromic acid, disodium salt	1	lb
	Potassium cyanide	1.1	lb
	Chloroform	0.13	gal
	Lead	13.2	lb
	Beryllium powder	69	lb
	Cupric chloride	1.1	lb
	Hydrofluoric acid	10.33	kg
	Potassium bichromate	2	lb
	Trichloroethylene	3.17	gal
	Aluminum oxide, powder	547.64	kg
	Chromium trioxide	2.77	kg
	Sulfur hexafluoride	2,500	lb
Building 239	Lead	1,000	lb
	Beryllium/Beryllium Oxide	25/50	kg
	Lithium Hydride	50	kg
Building 241	Acetic acid	1.31	gal
	Benzene	0.26	gal
	Lead	9.42	lb
	Mercury	282	lb
	Potassium hydroxide	226.88	lb
Building 261	Acetic acid	0.25	gal
	Acetone	0.13	gal
	Cadmium metal	5.5	lb
	Sodium Fluoride	0.28	lb
Building 262	Acetone	7.82	lb
	Beryllium metal	60	lb
	Cadmium metal	2.5	kg
	Thorium metal	100	lb
	Lithium hydride	167	lb
	Lead	2,000	lb
	Xylene	35	lb

**TABLE A.4–5.— Typical Hazardous Chemicals at Some Selected Facilities <sup>a</sup> at the Livermore Site (continued)**

Facility	Material	Approximate Quantity	Unit
Building 321	Beryllium	454	kg
	Lithium hydride	95	kg
	Acetone	18	gal
Building 322	Ammonium bifluoride	750	lb
	Chromic trioxide	750	lb
	Chromic acid (25-30%)	1,000	lb
	Chloroform	40	lb
	Copper Cyanide	1,200	lb
	Cupric Sulfate	5,000	lb
	Ferrous chloride	3,000	lb
	Hydrofluoric acid	150	lb
	Lead fluoroborate	500	lb
	Nickel ammonium sulfate	650	lb
	Nickel chloride	1,000	lb
	Nickel sulfate	1,200	lb
	Nitric acid (69-71%)	9,600	lb
	Potassium cyanide	600	lb
	Potassium dichromate	50	lb
	Sodium chromate	50	lb
	Sodium dichromate	50	lb
	Sodium cyanide	600	lb
	Sodium hydroxide (98% and less)	2,000	lb
	Silver nitrate	80	lb
	Chromic acid	83.5	lb
	Nitric acid (69-71%)	5,189	lb
	Cyanide solution	55	lb
Building 327	1,2-Dichloroethane	0.26	gal
	Hexane	1.0	gal
	Xylene	0.13	gal
	Methanol	1.13	gal
	Acetone	1.06	gal
	Propane	2.62	lb
	Hydrogen Peroxide	0.26	gal
	2-Butanone	2.38	gal
Building 332	HCl gas	55	lb
	Chlorine gas	100	lb
Building 334	Mercury	8	lb
	Lead	<2,300	lb
	Beryllium/beryllium oxide	200/400	kg
	Lithium hydride	200	kg
	NO <sub>2</sub>	40	kg
	High Explosives	10	g
Building 360 Complex <sup>c</sup>	1,2-Dibromo-3-chloropropane	1	lb
	Arsenic disulfide	1	lb
	Arsenic trioxide	1	lb
	Benzene	10	lb
	Cacodylic Acid	1	lb
	Cadmium dichloride	10	lb
	Carbon Tetrachloride	10	lb
	Chloroform	10	lb
	Cupric sulfate, anhydrous	10	lb

**TABLE A.4–5.— Typical Hazardous Chemicals at Some Selected Facilities <sup>a</sup> at the Livermore Site (continued)**

Facility	Material	Approximate Quantity	Unit
	Dichromic acid, disodium salt	10	lb
	Emetine dihydrochloride	1	lb
Building 360 Complex <sup>c</sup> (cont.)	Ether, anhydrous	100	lb
	Formaldehyde	100	lb
	Lead	10	lb
	Potassium cyanide	10	lb
	Selenium	1	lb
	Silver nitrate	1	lb
	Sodium cyanide	10	lb
	Xylene	100	lb
	Mercury	1	lb
Buildings 378/379	Perchloric acid	b	–
	Nitric acid	b	–
	Hydrofluoric acid	b	–
	Hydrochloric acid	b	–
Building 392	Acetone	19	L
	Ethanol	208	L
	Sol-Gel (97% Ethanol/3% tetraethyl orthosilicate)	284	L
	Hydrofluoric acid	55	gal
	Ammonia	8	gal
	Epoxy ECA-1	5	L
	Epoxy ECA-2.5	5	L
	Tetraethyl orthosilicate	30	L
Building 519	Acetone	1.24	lb
	Dichloroethane	3.8	lb
	Methanol	19.1	lb
Buildings 581/681	Acetone	210	L
	Ethyl alcohol	256	L
	Isopropyl alcohol	20.5	L
	Chloroform	0.5	L
	Nitric acid	2,800	L
	Phosphoric acid	2,800	L
	Mercury, metallic	3.5	L
	Sodium hydroxide	1,906	kg
	Toluene	18	L
	Xylene	18	L
Building 695	Sulfuric acid (98%)	2,786	kg
	Sodium hydroxide (50%)	1,737	kg
	Hydrogen peroxide (50%)	1,665	kg
	Ferric sulfate (50%)	1,709	kg
Container Security Testing Facility	Cadmium	<10	lb
	Arsenic	1	lb
	Lead	<4,000	lb
	Carbon tetrachloride	<20	lb

Source: DOE 2003a; LLNL 1997f, 1997g; LLNL 1999b, 1999g; LLNL 2000b, 2000d, 2000j, 2000k, 2000l, 2000o, 2000p; LLNL 2001a, 2001b, 2001e, 2001f, 2001m, 2001x, 2001y, 2001z, 2001ag, 2001ah, 2001aw; LLNL 2002k, 2002ak, 2002aq, 2002ar, 2002by, 2002cq, 2002cu, 2003cw, 2002g, 2002s.

<sup>a</sup> Facilities not listed may also have small quantities of similar types of chemicals.

<sup>b</sup> May be present in small laboratory quantities.

<sup>c</sup> The 360 complex is comprised of the following buildings: 361, 362, 363, 364, 365, 366, 367, 373, 376, 377, and 368 (planned).

ft<sup>3</sup> = cubic feet; gal = gallons; kg = kilograms; L = liters; lb = pounds; ml = milliliter.



**TABLE A.4–6.— Typical Hazardous Chemicals at Some Selected Facilities at Site 300**

Facility	Material	Approximate Quantity	Unit
Building 801	Isopropyl alcohol	3	kg
	Ethyl alcohol (cleaner)	3	kg
	Bromoform	500	ml
	Ethyl alcohol (coolant)	100	ml
	Freon 12	640	lb
	Kodak Industrial Starter	5	L
	Kodak Industrex Developer	10	kg
	Mercury	<0.4	kg
	Methane	55	kg
	Methanol	1	L
	Sulfur hexafluoride	1,000	kg
	Acetone	6	kg
Building 812	Isopropyl alcohol	3	kg
	Ethyl alcohol (cleaner)	3	kg
	Bromoform	500	ml
	Ethyl alcohol (coolant)	100	ml
	Freon 12	640	lb
	Kodak Industrial Starter	5	L
	Kodak Industrex Developer	10	kg
	Mercury	<0.4	kg
	Methane	55	kg
	Methanol	1	L
	Propane	40	kg
	Sulfur hexafluoride	1,000	kg
	Acetone	6	kg
Building 850	Isopropyl alcohol	3	kg
	Ethyl alcohol (cleaner)	3	kg
	Bromoform	500	ml
	Ethyl alcohol (coolant)	100	ml
	Freon 12	640	lb
	Kodak Industrial Starter	5	L
	Kodak Industrex Developer	10	kg
	Mercury	<0.4	kg
	Methane	55	kg
	Methanol	1	L
	Propane	40	kg
	Sulfur hexafluoride	1,000	kg
	Acetone	6	kg

**TABLE A.4–6.— Typical Hazardous Chemicals at Some Selected Facilities at Site 300 (continued)**

Facility	Material	Approximate Quantity	Unit
Building 851	Isopropyl alcohol	3	kg
	Ethyl alcohol (cleaner)	3	kg
	Bromoform	500	ml
	Ethyl alcohol (coolant)	100	ml
	Freon 12	640	lb
	Kodak Industrial Starter	5	L
	Kodak Industrex Developer	10	kg
	Mercury	<0.4	kg
	Methane	55	kg
	Methanol	1	L
	Propane	40	kg
	Sulfur hexafluoride	1,000	kg
	Acetone	6	kg
Building 883	Acetone	4.99	kg
	Acetyltriethyl citrate	139	kg
	Acrylic resin	36	kg
	Alkyloxypolyethylene Oxyethanol	106	kg
	Alumina	5.9	kg
	Ammonium carbonate	15	kg
	B-naphthol	6.3	kg
	Carbon tetrachloride	25	kg
	Chloro-fluoro hydrocarbon	8.2	kg
	Cyanuric acid	20.4	kg
	Cyclohexane	30.8	kg
	Dextrin	2.7	kg
	Dibutyltin dilaurate	2.7	kg
	Diethyleneamine	24.9	kg
	Dimethyl ether	16.8	kg
	Dimethyl sulfoxide	63	kg
	Diethyl sebacate	5.9	kg
	Ethanol	15.9	kg
	Ethyl Acetate	60.3	kg
	Ethylene glycol	13.2	kg
	Glycerol	5.4	kg
	Hexane	50.3	kg
	Hydrochloric acid	27.2	kg
	Hydroquinone	2.7	kg
	Insulation oil	1,156	kg
	Isobutane	2.7	kg
	Isodecyl perarsonate	27.2	kg

**TABLE A.4–6.— Typical Hazardous Chemicals at Some Selected Facilities at Site 300 (continued)**

Facility	Material	Approximate Quantity	Unit
Building 883 (cont.)	Isopropanol, fluorochemical trivalent chromium compound	82.5	kg
	Lead chromate	28.1	kg
	Lead dioxide	0.14	kg
	Mercury	0.08	kg
	Methyl-ethyl ketone	1.5	kg
	Naptha	44.9	kg
	N-butyl acetate	18.6	kg
	Nitromethane	43.1	kg
	Oxalic acid	3.4	kg
	Petric acid	0.45	kg
	Petroleum hydrocarbon	260.7	kg
	Phenol	5.4	kg
	Phosphorous trichloride	74.8	kg
	Potassium chromate	0.086	kg
	Potassium iodide	4.3	kg
	Propane	1.8	kg
	Silica	1.4	kg
	Silver	0.38	kg
	Sodium bicarbonate	38.5	kg
	Sodium bromide	3.2	kg
	Sodium hydroxide	2.9	kg
	Sodium iodide	14.9	kg
	Sodium nitrate	5.2	kg
	Sodium phosphate	13.6	kg
	Styrene	59	kg
	Sulfuric acid	2.9	kg
	Thorium nitrate	14.5	kg
	Titanium dioxide	1,270	kg
	Toluene	17.7	kg
	Transformer oil	109.3	kg
	Trisodium phosphate dodecahydrate	0.9	kg

Source: LLNL 2001ao, 2001av; LLNL 2002j, 2002l.

kg = kilograms; L = liters; lb = pounds; ml = milliliters.

**TABLE A.4–7.—Livermore Site Criteria Pollutant Emissions in 2002**

<b>Pollutant</b>	<b>Emissions (kilograms per day) <sup>a,b,c</sup></b>
Precursor organic compounds	16
Nitrogen oxides	67
Carbon monoxide	17
Particulates (PM <sub>10</sub> )	6.1
Oxides of sulfur	2.8

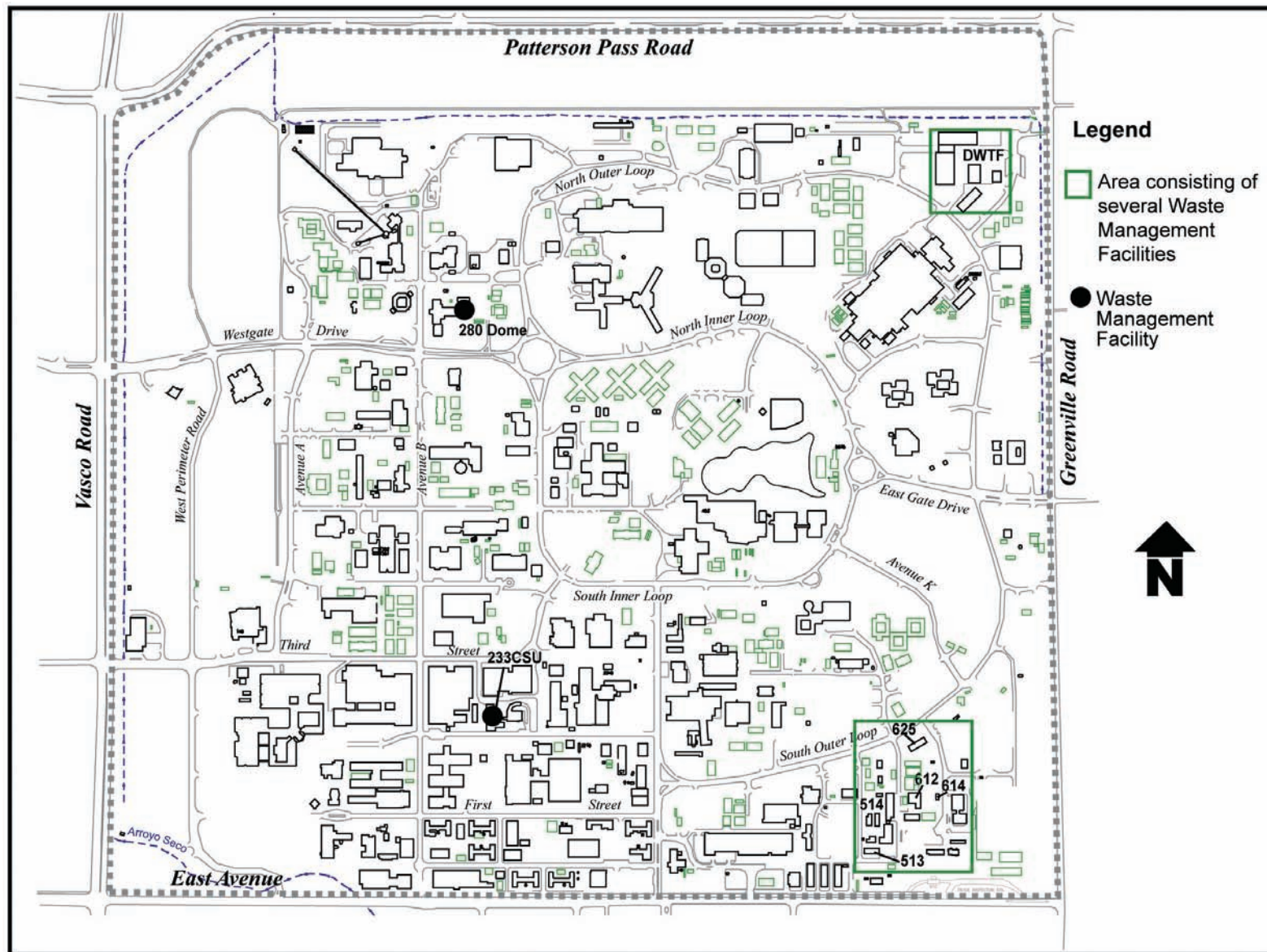
Source: LLNL 2003I.

<sup>a</sup> Summary information. Numbers may be rounded.<sup>b</sup> Estimates are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.<sup>c</sup> One kilogram equals 2.2 pounds.**TABLE A.4–8.—Site 300 Criteria Pollutant Emissions in 2002**

<b>Pollutant</b>	<b>Emissions (kilograms per day) <sup>a,b,c</sup></b>
Precursor organic compounds	0.23
Nitrogen oxides	1.1
Carbon monoxide	1.0
Particulates (PM <sub>10</sub> )	0.09
Oxides of sulfur	0.07

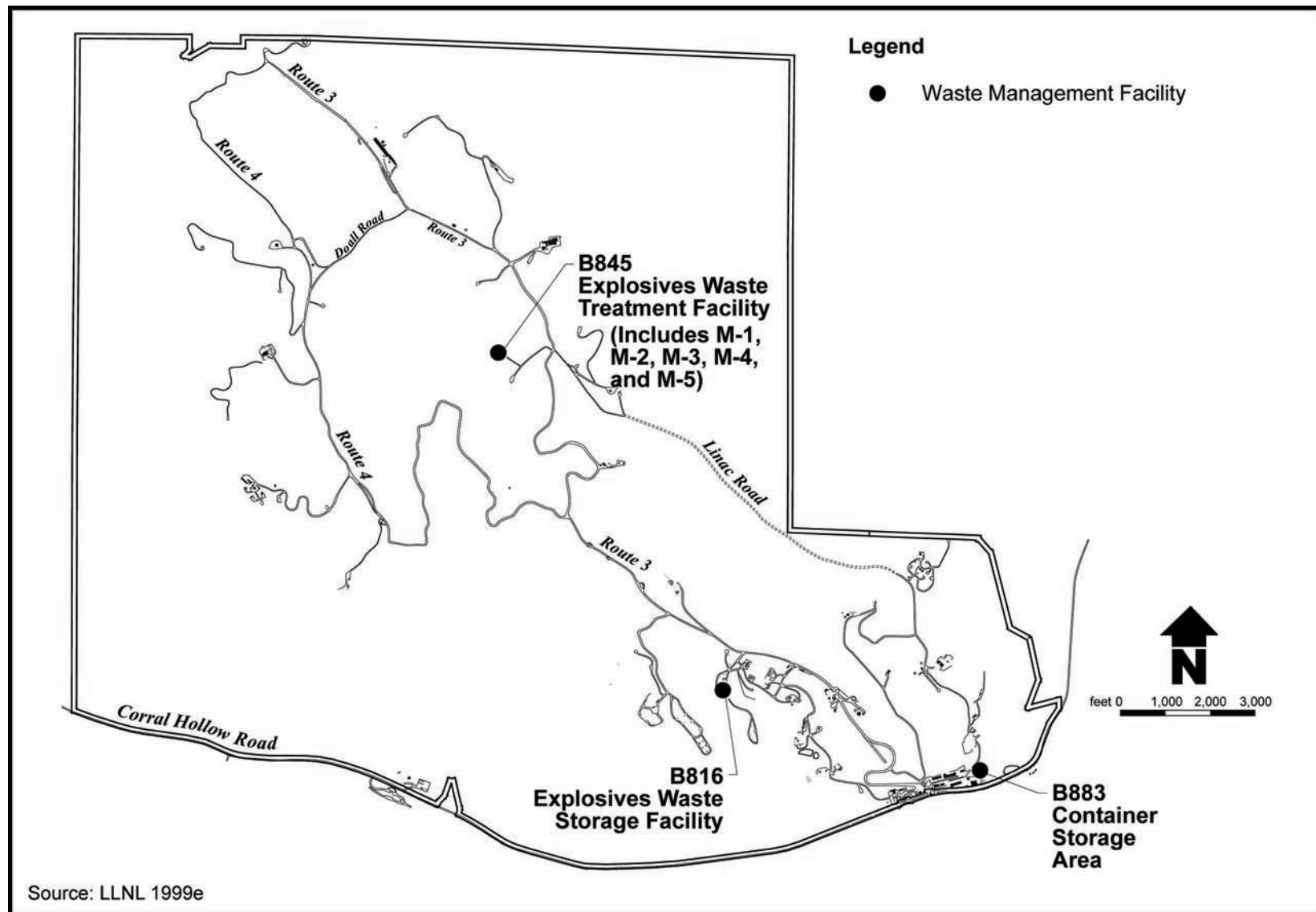
Source: LLNL 2003I.

<sup>a</sup> Summary information. Numbers may be rounded.<sup>b</sup> Estimates are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.<sup>c</sup> One kilogram equals 2.2 pounds.



Source: LLNL 2003o.

**FIGURE A.4-1.—Waste Management Facilities at the Livermore Site**



Source: LLNL 1999h.

FIGURE A.4-2.—Waste Management Facilities at Site 300